RESEARCH

Cariboo Forest Region

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Silvicultural systems for Douglas-fir stands on very deep snowfall mule deer winter ranges

INTRODUCTION

In the ICHmk3 biogeoclimatic subzone in the Cariboo Forest Region, Douglas-fir stands tend to be even-aged. These seral forests are eventually replaced with western redcedar-subalpine fir climax communities. Douglas-fir stands, within this wetbelt ecosystem, are important to the forest industry and wildlife. They are particularly valuable as mule deer winter range because of the snow interception cover, thermal cover, and Douglas-fir forage provided by mature and older trees. Douglas-fir stands in these ecosystems are typically clearcut which effectively removes large portions of the winter range for long periods of time. Furthermore, regenerating these large clearcuts with Douglas-fir is often difficult due to frost, snow press, and/or vegetation competition. The typical silvicultural system used on mule deer winter range in uneven-aged Douglas-fir, is low-volume, single tree selection. This system is not ecologically appropriate for these even-aged stands. This pilot study was designed to explore openings, of variable size, orientation and shape, that could be used in conjunction with group selection, patch cut, or clearcut silvicultural systems to maintain Douglas-fir stands on mule deer winter range.

OBJECTIVES

The specific objectives of the study are:

1. to determine the effect of the openings on the survival, abundance, and growth of natural regeneration and planted Douglas-fir seedlings;
2. to monitor mule deer use of the various openings in order to determine the impact on mule deer habitat.
3. to determine the effect of the openings, in combination with site preparation, on the abundance and growth of forage species available to deer in shallow snow conditions;
4. to determine if mechanical site preparation in the different sizes of openings will improve survival and growth of planted seedlings;
5. to determine the effects of stumping and a biological control fungus on the persistence and spread of *Armillaria* root disease;

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6. to determine the effect of opening size, shape and orientation on the wind firmness of the surrounding stand; and
7. to determine the economic feasibility of harvesting different opening sizes.

STUDY SITE

The study site is located on the southwest aspect of Viewland Mountain above Horsefly Lake within the ICHmk3 biogeoclimatic subzone. Elevation ranges from 965-1130 m while the slope ranges from 0 to 30%. The soils are mainly brunisols or luvisols, with a sandy loam or silt loam texture, and an average coarse fragment content of 44%. The stand, initiated by a hot fire about 100 years ago, is predominantly Douglas-fir (70%) with lesser amounts of lodgepole pine (18%), hybrid white spruce (9%) and western redcedar (2%). There is a small component of subalpine fir, aspen, paper birch and black cottonwood. The net merchantable volume for the conifers is 412 m3/ha accrued mostly from trees 25-55 cm in diameter. Snags and large pieces of coarse woody debris are sparse.

TREATMENTS

Approximately 20 ha (20%) of the site was harvested from openings, roads and landings. A cutting cycle of 50 years and 20% volume removal at each entry will maintain the following seral stage distribution through time: 40% late (>150 years), 40% mid (51-150 years) and 20% early (0-50 years). There are 20 openings of the following sizes: 0.25 ha, 0.5 ha, 1.0 ha and 2.0 ha (Table 1). Four of the 1 ha openings are orientated across the contour while the other four 1 ha openings are along the contour. Orientation in these two different directions may affect seedling establishment and growth because of the variation in duration and intensity of light, and the ability to drain cold air. Openings of each size are distributed across site units which are zonal, drier than zonal, and wetter than zonal. The zonal and drier openings were paired then randomly assigned a site preparation option of disc trenching or not. The wetter openings (#3 and #8) will be mounded and high microsite planted. Within the *Armillaria* infected opening (#1) half the area will be stumped and the other half treated with a biological control fungus (*Hypholoma fasciculare*). All the openings will be operationally planted with Douglas-fir seedlings in the spring of 1998 after site preparation.

Partial cutting on Viewland Mountain above Horsefly Lake, BC

See Addendum for an oblique aerial photo

		Opening Size and Orientation				
Ecological Description	Site Preparation	0.25 ha 15 x 165 m	0.50 ha 30 x 165 m	1.0 ha 60 x 165 m along contour	1.0 ha 60 x 165 m across contour	2.0 ha
Dry zonal and drier	Yes No	18 19	15 16	10 11	12 9	
Mid zonal	Yes No	17 20	13 14	4 5	7 6	2 1-stump/biocontrol
Wet zonal and wetter	Yes			8-mound/high microsite plant		3-mound/high microsite plant

Table 1. Study matrix of ecosystem associate, site preparation, opening size and opening number

HARVESTING

In the fall of 1997, harvesting was done with a fellerbuncher, then ground skidded to landings for processing. Weldwood Ltd. staff planned and supervised harvesting operations while FERIC staff undertook a cost and productivity study of the various components of the operation. During harvesting, the fellerbuncher operator stubbed deciduous trees and snags to create and maintain wildlife trees.

In the long-term, there is concern for detrimental site disturbance due to repeated entries into the area; therefore, a network of permanent skid trails was designed and pre-marked to be used each time the stand is entered.

MONITORING OF TREATMENT EFFECTS

Regeneration and vegetation: In each opening, there was one permanent TRENDS plot established to document pre-harvest the following attributes: biogeoclimatic classification, site index, soil description, stand structure, coarse woody debris, and vegetation. Post-harvest, the plots are monitored for establishment and growth of natural and planted seedlings, vegetation competition, site disturbance and accumulation of coarse woody debris. TRENDS plots were developed by the Northern Interior Vegetation Management Association (1995) to operationally monitor silvicultural treatments over the long-term.

Snow depth and density may effect deer use and regeneration success. It will be measured at sample points along transect lines that cross the narrow dimensions of the openings and into the forest on either side. Two openings of each size class will be surveyed monthly from December through May.

The specific details of each harvesting phase were as follows:

Falling:	Mechanical with fellerbuncher (99%) and handfalling of oversized stems (1%).
Skidding	Whole tree skidding with rubber-tired grapple skidder.
Processing:	Mechanical limbing and processing to short logs on central landings.
Loading:	Loader on central landings loading onto short-log trucks.
Deactivation:	Temporary waterbars on skid trials and roads (winter) followed by permanent deactivation (summer 98)

Deer use of the various openings to the surrounding forest will be studied with two methods. First, while monthly snow depth measurements are conducted, observational records will be kept. At the same time, a traverse of every opening edge will be completed to intercept tracks that approach, but do not cross the opening. Second, permanent transects lines, set across slope through the forest and openings, will be surveyed monthly from December to March. This will provide an assessment of the relative level of use of the treated and untreated areas, direction of travel and pattern of behavior.

1.0 ha (60 X 165 m) opening containing stubs for wildlife

Seed fall will be monitored annually to determine the potential for natural regeneration within the openings.

Windthrow will be monitored in the fall on an annual basis until the stand stabilizes.

Harvesting costs and production will be tracked by opening size for valuation purposes and to determine the economic feasibility.

Soil disturbance and availability of seedbeds (mineral soil, or mixed mineral and organic) will be determined in each opening after site preparation.

Bark beetle surveys will be conducted each fall. All infected trees will be marked, numbered and stem-mapped for salvage during the winter.

Armillaria will be monitored in the stumped and bio-control portions of opening #1.

END PRODUCTS

The 'Handbook for timber and mule deer management co-ordination on winter ranges in the Cariboo Forest Region' (Armleder *et al.*, 1986) was developed to provide information on mule deer ecology, and appropriate management activities at the stand and landscape (winter range) level. Much of the data for this handbook was collected from shallow to deep snowpack winter ranges where the Douglas-fir forests are more ecologically suited to single tree selection harvesting. This research project will augment the handbook by providing valuable data from very deep snowpack mule deer winter ranges. Also, this study will provide useful information on how to regenerate Douglas-fir within the ICH in conjunction with various silvicultural systems.

DURATION

The co-operators (Research Section (MOF), BC Environment, and Weldwood of Canada) have received five years of funding from Forest Renewal BC for this project. The trial will be monitored until at least free-growing (about 7-12 years) to evaluate treatment effects. A replicated research trial may be implemented at an earlier date if some of treatments look promising. Progress reports will be produced regular intervals and a final report when the stand is declared free-growing.

REFERENCES

Armleder, H., R. Dawson and R. Thomson. 1986. Handbook for timber and mule deer management co-ordination on winter ranges in the Cariboo Forest Region. B.C. Min. For., Victoria, B.C., Land Manage. Handb. 13. 98 p.

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Addendum

Aerial Photo of Viewland Mt. Taken on April 9, 1998